L76X GPS Module User Manual

OVERVIRE

This is a general GNSS module which supports Multi-GNSS systems: GPS, BDS, and QZSS, with advantages such as fast positioning, high accuracy, low power consumption, and so on.

SPECIFICATION

GPS

- Band: GPS L1(1575.42Mhz), BD2 B1 (1561.098MHz)
  - Channels: 33 tracking ch, 99 acquisition ch, 210 PRN ch
  - C/A code
  - SBA: WAAS, EGNOS, MSAS, GAGAN
- Horizontal position accuracy:
  - Autonomous: <2.5mCEP
- Time-To-First-Fix @-130dBm (EASY™ enabled):
  - Cold starts: <15s
  - Warm starts: <5s
  - Hot starts: <1s
- Sensitivity:
  - Acquisition: -148dBm
  - Tracking: -163dBm
  - Re-acquisition: -160dBm
- Dynamic performance:
  - Altitude (max): 18000m
  - Velocity (max): 515m/s
  - Acceleration (max): 4G

GENERAL

- Communication interface: UART

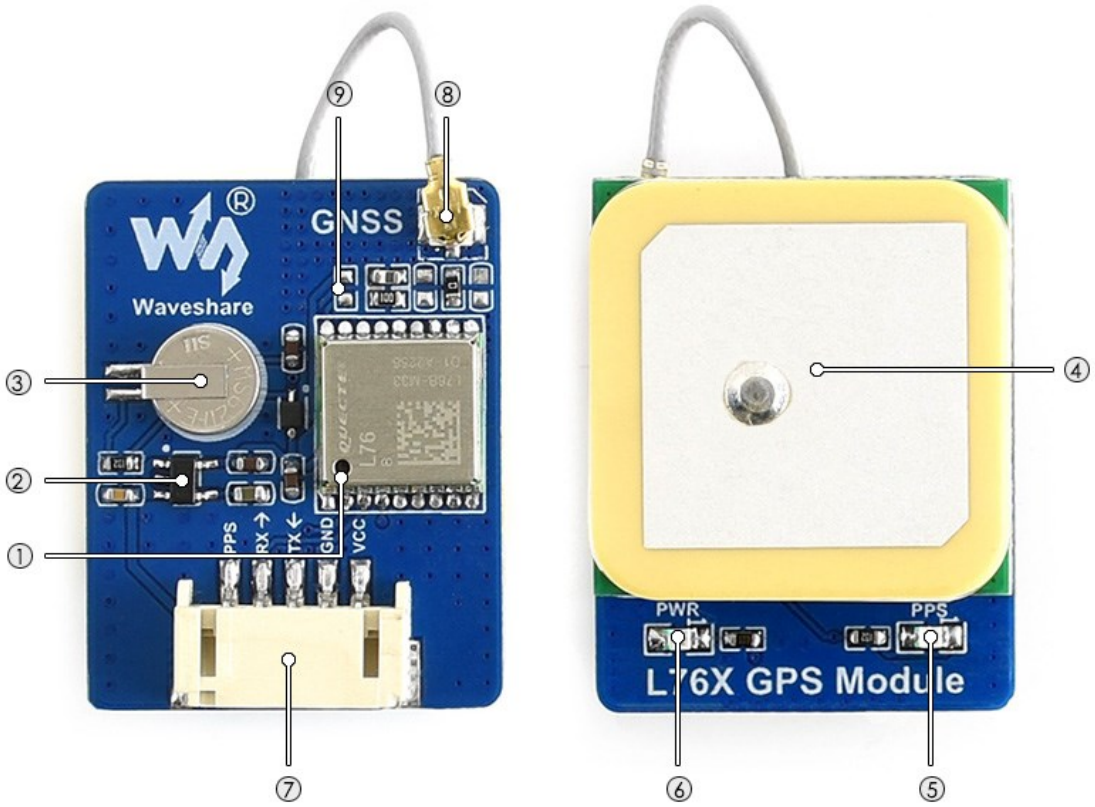
- Baudrate: 4800~115200bps (9600bps by default)
- Update rate: 1Hz (default), 10Hz (max)
- Protocols: NMEA 0183, PMTK
- Power supply voltage: 5V / 3.3V
- Operating current: 11mA
- Operating temperature: -40℃ ~ 85℃
- Dimensions: 32.5mm x 25.5mm

INTERFACE

PIN	Description
VCC	2.7V~5V
GND	Ground
TX	Serial data transmit
RX	Serial data receive
PPS	GPS status indicator（Pulses per seconds）

CONTENT

HARDWARE



1. **L76X GPS Module on board resource**
2. **L76B module**
3. **RT9193-33:** power manager
4. **Rechargeable MS621FE Li battery:** for preserving ephemeris information and hot starts
5. **Ceramics active antenna**
6. **GPS status indicator**
7. **Power indicator**
8. **PH2.0 5PIN connector**
9. **GNSS antenna connector**
10. **Backup mode wakeup jumper:** not soldered by default, short the jumper to exit backup mode

TESTING IN PC

Connect GPS antenna to L76X GPS module, and wire it to USB to UART module. Connect USB to UART module to PC. PWR lights on after connecting.

L76X GPS Module	CP2102 module
VCC	5V/3.3V
GND	GND
RX	TXD
TX	RXD
PPS	NC

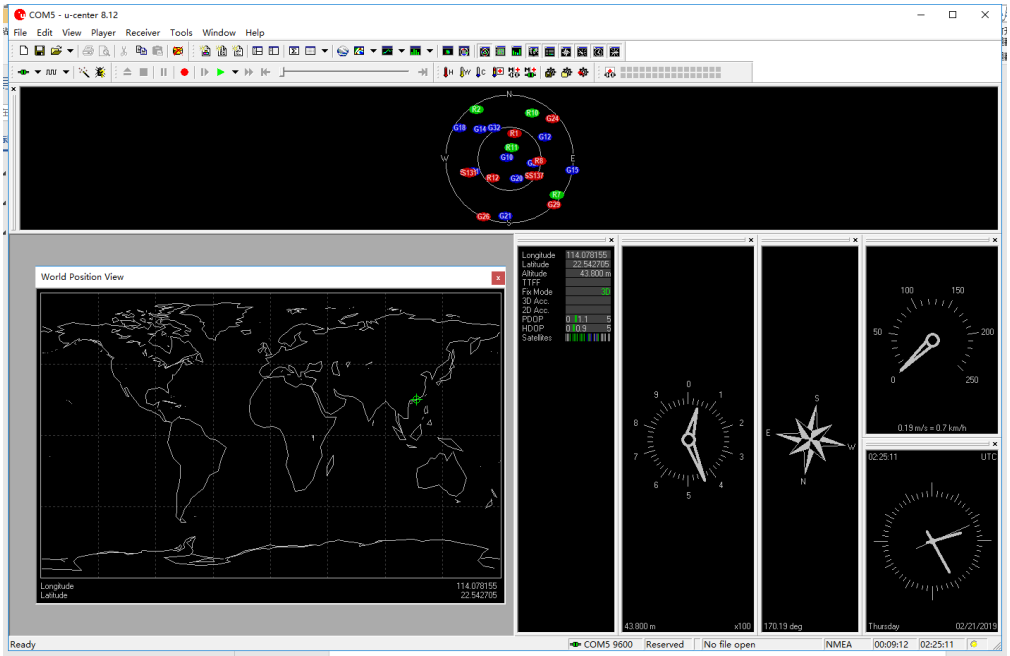
Open serial assistant software in PC. Select the correct COM port (according to the Device Manager), set baud rate: 9600, data bit: 1, stop bit: 1

【Note】

a) Please set the module or receiver of antenna outdoor for stable GPS signal

b) Generally, first time module should use about 35s to locate (cold starting), the locating time (first) maybe longer even failed because of environment, please be patient.

Download U-center software from wiki. Unzip it and install. Open U-center software, click Receiver menu, choose Port, and select the correct com port (refer to Devices Manager). Set baud rate: 9600 then click button to connect L76X GPS Module. U-center display information after connecting.



If you want to check the area better, you can install GoogleEarthPluginSetup.exe tool, which allow you to choose Google Earth under View menu

【Note】The result you get from Google Earth maybe different with actual area because of dynamic drift of GPS

DEMO CODES

The demo code is set for 9600 and 115200 baudrate, make sure the baudrate of L76X GPS module is one of them if you use demo codes.

DOWNLOAD DEMO CODE

Find the product in Waveshare website, open the wiki and download demo code from wiki.

Resources [edit]

- User Manual
- Schematic

Demo code [edit]

- Code

Datasheet [edit]

Unzip:

Arduino: Arduino examples based on Arduino UNO

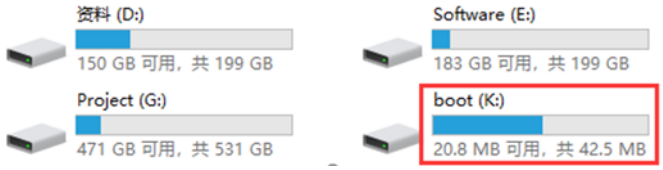
Raspberry Pi: Raspberry Pi examples include wiringpi and python codes

STM32: STM32 examples based on STM32F103

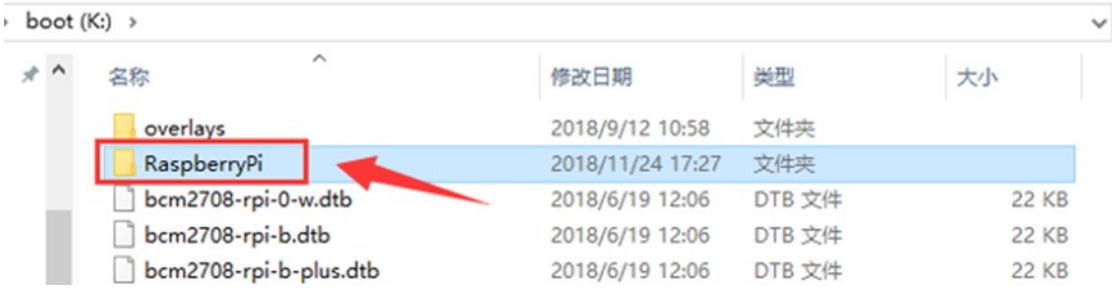
RASPBERRY PI EXAMPLES

COPY EXAMPLES

Insert SD card (which has installed Raspbian image) to PC by card reader

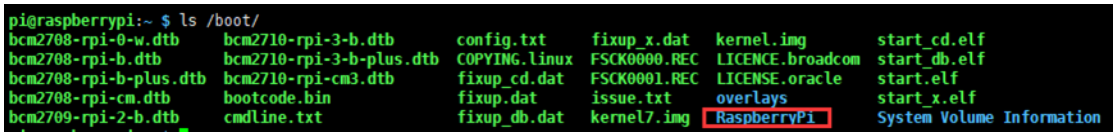


Copy Raspberry Pi examples (the folder we download and unzip above) to BOOT directory of SD card



Exit and insert the card to Raspberry Pi, then start.

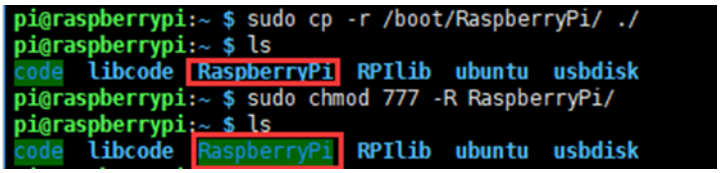
Check it: **ls /boot**



Copy it to /home/pi

sudo cp -r /boot/RaspberryPi/ ./

sudo chmod 777 -R RaspberryPi/



LIBRARIES INSTALL

Examples should be used with libraries installed

Install **BCM2835**:

Download libraries from BCM2835 website:

http://www.airspayce.com/mikem/bcm2835/

```
sudo tar zxvf bcm2835-1.xx.tar.gz
cd bcm2835-1.xx
sudo ./configure
sudo make
sudo make check
sudo make install
```

【Note】xx is the version of libraries, for example, if the libraries you download is bcm2835-1.52. The command you should execute is sudo tar zxvf bcm2835-1.52.tar.gz

Install **wiringPi**:

```
sudo apt-get install git
sudo git clone git://git.drogon.net/wiringPi
cd wiringPi
sudo ./build
```

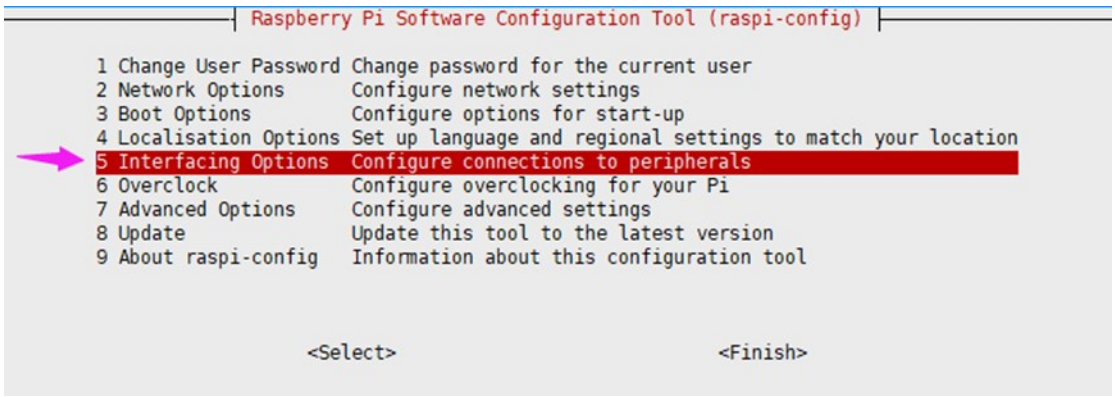
Install **python:**

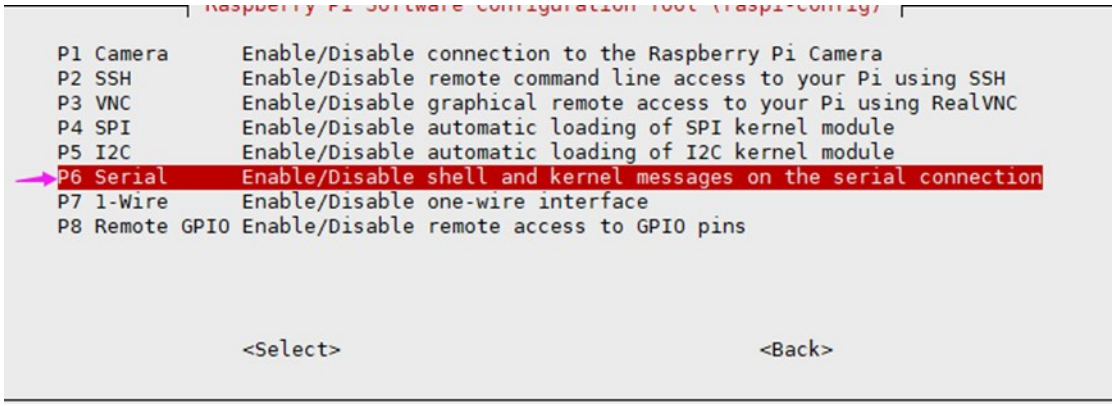
```
sudo apt-get install python-pip
sudo pip install RPi.GPIO
sudo pip install spidev
sudo apt-get install python-imaging
sudo apt-get install python-smbus
sudo apt-get install python-serial
```

ENABLE SERIAL PORT

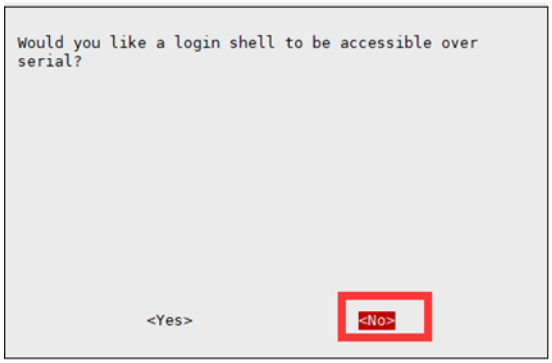
UART interface should be used for communicating, so we need to enable hardware serial of Raspberry Pi.

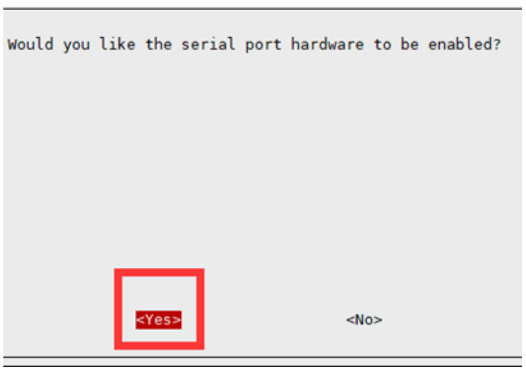
sudo raspi-config





Disable login shell function and then enable hardware serial





INSTALL MINICOM

minicom is a serial assistant tool for Linux.

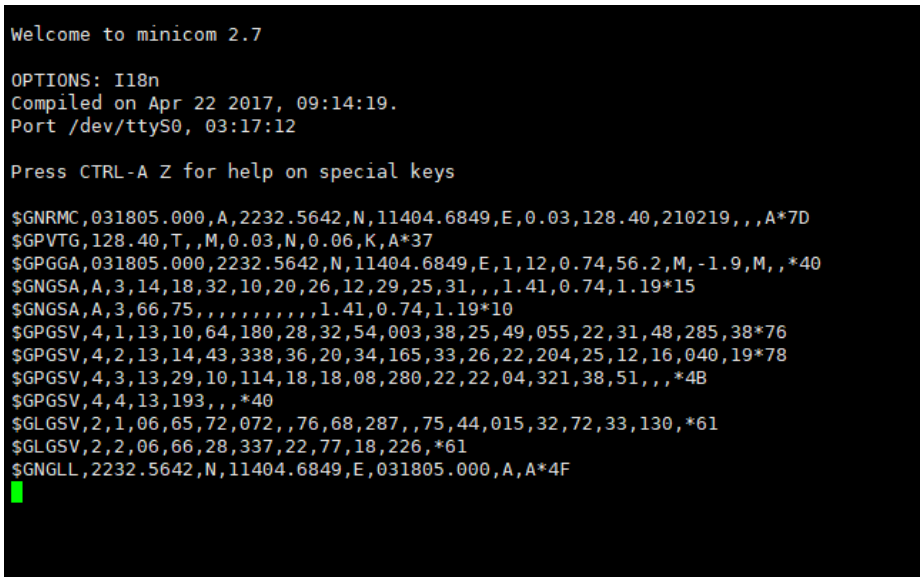
Install minicom:

sudo apt-get install minicom

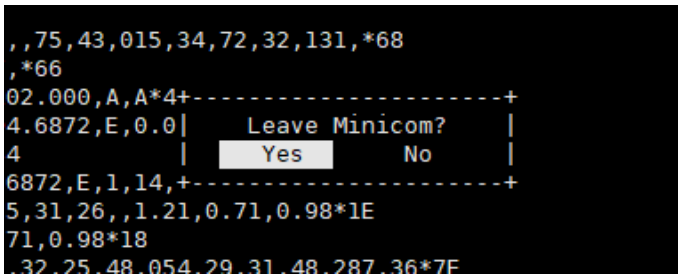
Using minicom:

minicom -D /dev/ttyS0 -b 9600

【Note】If you use Raspberry Pi zero, the serial port should be ttyAMA0, you can confirm the port by command: ls -l /dev/serial0 The default baud rate of minicom is 115200, here we use parameters -b 9600 to set it as 9600

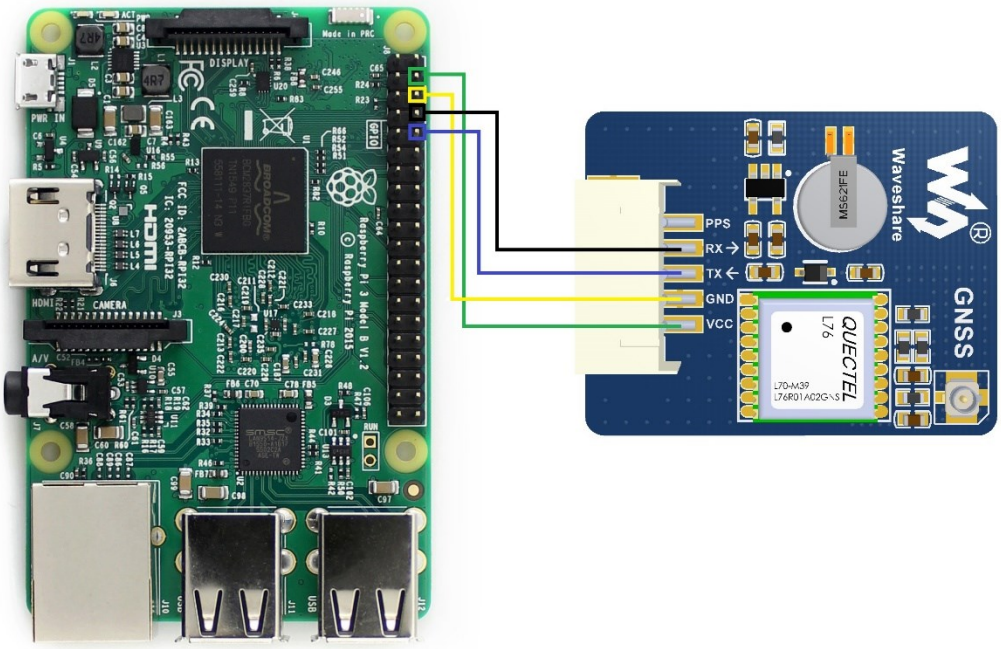


If you want to exit, you can press Ctrl + A, press X and choose Yes, then Enter.



HARDWARE CONNECTION

The color of wire you get may be different with here, you should connect the module according to the silk screen printing.



L76X GPS Module	Raspberry Pi (Board)	Raspberry Pi (BCM)
VCC	5V	5
GND	GND	GND
TX	10	P15
RX	8	P14

RUNNING CODES

Enter RaspberryPi folder (The directory of example) and run it with commands:

wiringPi code:

```
cd ~/RaspberyPi/wiringpi
sudo ./main
```

python code :

```
cd ~/RaspberryPi/python
sudo python main.py
```

EXPECTED RESULT

It requires about 35s to locate (first time).

Data printed first is original data.

Time: L76X GPS Module output time.

```
,1.10,0.78,0.78*1E
$GPGSV,4,1,13,10,58,179,25,32,56,010,41,42,50,127,,31,49,292,40*79
$GPGSV,4,2,13,14,46,343,36,25,46,051,31,20,30,165,32,26,26,205,30*7E
$GPGSV,4,3,13,12,13,038,27,29,12,111,23,22,08,320,41,18,07,276,*7A
$GPGSV,4,4,13,193,,,*40
$GLGSV,2,1,06,65,72,092,,76,67,303,,75,39,017,27,66,33,338,33*6E
$GLGSV,2,2,06,72,29,134,,77,21,231,*68
$GNGLL,2232.6312,N,11404.6593,E,032729.171,A,A*43
$GPZDA,032729.571,21,02,2019,,*53
$GNRMC,032729.571,A,2232.6331,N,11404.6643,E,0.58,297.14,210219,,,A*72
$GPVTG,297.14,T,,M,0.58,N,1.08,K,A*30
$GPGGA,032729.571,2232.6331,N,11404.6643,E,1,12,0.78,131.9,M,-1.9,M,,*70
$GNGSA,A,3,10,32,31,14,25,20,26,12,22,29,,,1.10,0.78,0.78*12
$GNGSA,A,3,66,75,,,,,,,,,,,1.10,0.78,0.78*1E
$GPGSV,4,1,13,10,58,179,23,32,56,010,41,42,50,127,,31,49,292,38

Time: 11:27:29
Latitude and longitude: 22.326331  N  114.046643  E
Baudu Coordinates    22.547066,114.089375
```

【Note】Even the default baud rate of L76X GPS Module is 9600, it is changed to 115200 in code. If you find that 9600 cannot work next time, please check if it is changed.

STM32 EXAMPLES

The development board used here is Waveshare XNUCLEO-F103RB, whose chip is STM32F103RBT6. The code is based on HAL

HARDWARE CONNECTION

Wire L76X GPS Module to STM32 board, and connect USB to UART (USART1) interface of STM32 board to PC

L76X GPS Module	**STM32**
5V	5V
GND	GND
TX	PA10
RX	PA9

【Note】Even the default baud rate of L76X GPS Module is 9600, it is changed to 115200 in code. If you find that 9600 cannot work next time, please check if it is changed.

EXPECTED RESULT

It requires about 35s to locate (first time).

Data printed first is original data.

Time: L76X GPS Module output time.

ARDUINO EXAMPLES

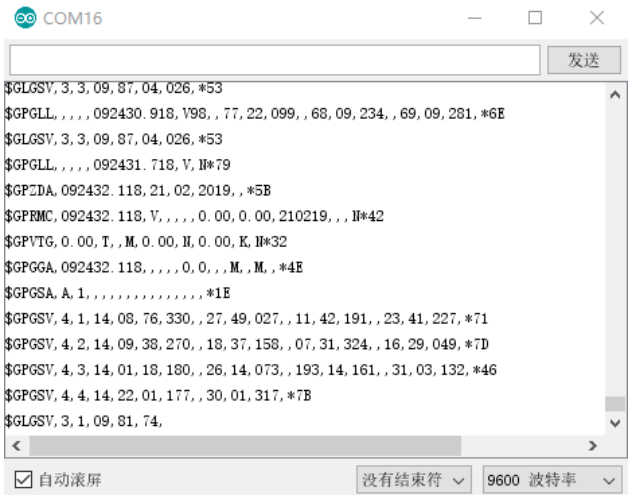
The development board used here is UNO PLUS

HARDWARE CONNECTION

L76X GPS Module	Arduino
5V	5V
GND	GND
TX	2
RX	3

EXPECTED RESULT

It requires about 35s to locate (first time). Open serial monitor and set baud rate to 9600. Data printed first is original data.



FAQ

1. **Why the baud rate doesn't change after send changing command?**

   - Please check if the current baud rate is correct. If the satellites searched are too much, the module cannot allows the baud rate to be smaller. In this case, you can use SET_NMEA_OUTPUT command to reduce the output data per time and try again.

2. **Why the locating is not accurate?**

   - The accuracy is influenced by environment. Weather reason: The humidity is every high when raining, which weaken the intensity of the GPS signal. It often raining in summer, therefore, the intensity of phone signals is weak. High building reason: high buildings shelter from satellite, make GPS intensity became weak. Area problem: Suburbs have less satellite coverage, so GPS intensity is weak in these areas. Interference problem: Sometime, signals from satellites will be interrupted by atmosphere ionosphere, buildings, forest, water and son on.

3. **Why the locating result is different with smart phone?**

   - L76X GPS HAT use satellite locating. Smart phone use AGPS, LBS, WIFI and Bluetooth locating as well except satellite. Smart phone locate much faster. And the multi-satellite system used by smart phone are different with L76X's

4. How to exit from Backup mode?

   - Module output nothing if it enter Backup mode. You cannot exit from Backup mode even re-power. The only way to exit from Backup mode is that short R6 more than 0.5s